



# UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE  
United States Patent and Trademark Office  
Address: COMMISSIONER FOR PATENTS  
P.O. Box 1450  
Alexandria, Virginia 22313-1450  
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/749,529	12/30/2003	Yuegang Zhang	070702006000	8848

7590 06/07/2007  
Raj S. Dave  
Morrison & Foerster LLP  
1650 Tysons Blvd., Suite 300  
McLean, VA 22102

EXAMINER
----------

SINES, BRIAN J

ART UNIT	PAPER NUMBER
----------	--------------

1743

MAIL DATE	DELIVERY MODE
-----------	---------------

06/07/2007

PAPER

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

<b>Office Action Summary</b>	<b>Application No.</b> 10/749,529	<b>Applicant(s)</b> ZHANG ET AL.	
	<b>Examiner</b> Brian J. Sines	<b>Art Unit</b> 1743	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

#### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

#### Status

- 1) ☒ Responsive to communication(s) filed on 16 May 2007.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

#### Disposition of Claims

- 4) ☒ Claim(s) 1 and 4-30 is/are pending in the application.
- 4a) Of the above claim(s) 25-30 is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1 and 4-24 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

#### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

#### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All    b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.

#### Attachment(s)

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)                                | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)                       | 5) <input type="checkbox"/> Notice of Informal Patent Application                       |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)<br>Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____  |

## **DETAILED ACTION**

### ***Continued Examination Under 37 CFR 1.114***

A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 5/16/2007 has been entered.

### ***Terminal Disclaimer***

1. The terminal disclaimer filed on 4/18/2007 disclaiming the terminal portion of any patent granted on this application which would extend beyond the expiration date of 11/317,518 has been reviewed and is accepted. The terminal disclaimer has been recorded.
2. The terminal disclaimer filed on 4/18/2007 disclaiming the terminal portion of any patent granted on this application which would extend beyond the expiration date of 11/317,405 has been reviewed and is accepted. The terminal disclaimer has been recorded.

### ***Response to Arguments***

Applicant's arguments with respect to the amended claims have been considered but are moot in view of the new ground(s) of rejection.

### ***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

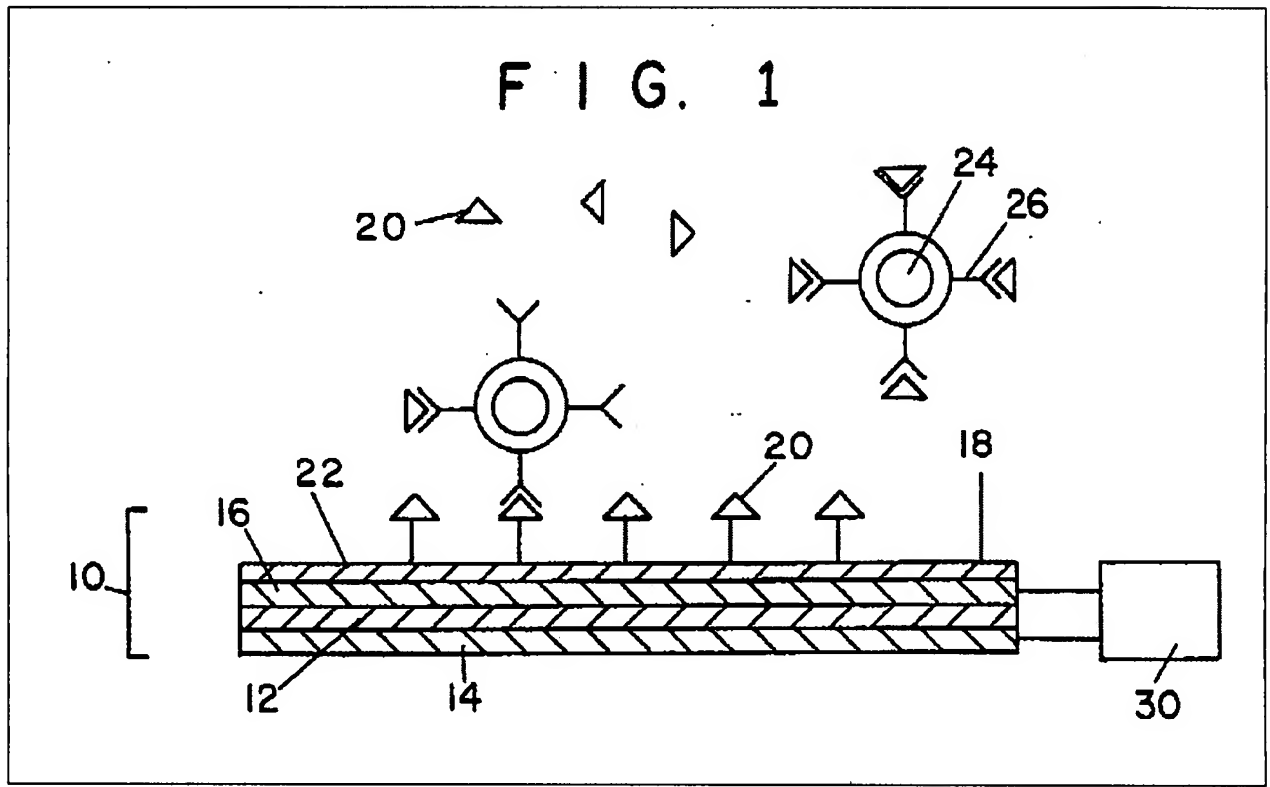
Art Unit: 1743

The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

Claims 1, 5 – 13, 22 and 23 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ward et al. (U.S. Pat. No. 5,501,986 A) (“Ward”) in view of Gao et al. (U.S. Pat. No. 6,218,507 B1) (“Gao”).

Regarding claims 1, 10 – 13, 22 and 23, Ward teaches a system 10 comprising: a piezoelectric resonator (quartz crystal wafer 12) comprising a layer of piezoelectric material sandwiched between a pair of electrodes (14 and 16), wherein at least one surface of one of the electrodes 16 comprises a functionalized surface (e.g., polystyrene coating layer 22 and surface 18) that is functionalized with a monolayer comprising a specific derivatized or immobilized binding pair (MOSBP-1, 20) to bind with target molecules (24 and 26) in a liquid sample; and a control and detection circuitry comprising an external oscillator circuit 30 (see, e.g., col. 3, line 25 – col. 6, line 20; figure 1).



Ward does not specifically teach the incorporation of a second piezoelectric resonator having a non-functionalized surface.

Ward does teach the incorporation of a secondary or reference piezoelectric resonator crystal (see col. 6, lines 5 – 20).

The use of a reference sensor comprising an uncoated portion, such as an electrode, with detection devices is well known in the art (see MPEP § 2144.03). For example, Gao teaches a related piezoelectric crystal resonator-based detection device comprising an uncoated or non-functionalized piezoelectric crystal electrode that functions to provide reference or control measurements. The determined measurement frequency is recorded as a base frequency and as a blank control measurement that is used with the coated sensing electrode to provide accurate gas detection measurements (see, e.g., col. 9, lines 3 – 16). Consequently, as indicated by Gao, a

Art Unit: 1743

person of ordinary skill in the art would accordingly have recognized the suitability of incorporating such a secondary or reference electrode that is non-functionalized to provide accurate detection measurements. As shown by Gao, a person of ordinary skill in the art would accordingly have had a reasonable expectation for success of incorporating of a second piezoelectric resonator having a non-functionalized electrode surface as claimed with the disclosed sensing device in order to facilitate accurate detection measurements. The prior art can be modified or combined to reject claims as *prima facie* obvious as long as there is a reasonable expectation of success (see MPEP § 2143.02). Therefore, it would have been obvious to a person of ordinary skill in the art to incorporate the use of a second piezoelectric resonator having a non-functionalized electrode surface as claimed with the disclosed sensing device in order to facilitate accurate detection measurements.

Regarding claims 5 – 9, these claims are considered statements of intended use regarding how the control circuitry is used to operate the claimed device. The disclosed measurement and control circuitry is apparently capable of performing in the manner claimed. If the prior art structure is capable of performing the intended use, then it meets the claim.

2. Claim 4 is rejected under 35 U.S.C. 103(a) as being unpatentable over Ward and Gao view of Yamada et al. (U.S. Pat. No. 6,842,088 B2) (“Yamada”).

Regarding claim 4, the cited prior art does not specifically teach the use of piezoelectric resonators comprising film bulk acoustic resonators (“FBAR’s”). However, Yamada teaches the use of film bulk acoustic resonator’s as sensing devices (see, e.g., col. 1, lines 10 – 22). Consequently, as indicated by Yamada, a person of ordinary skill in the art would accordingly have recognized the suitability of using a film bulk acoustic resonator device for sensing (see

Art Unit: 1743

MPEP § 2144.07). Therefore, it would have been obvious to a person of ordinary skill in the art to incorporate the use of a film bulk acoustic resonator as claimed with the disclosed sensing device.

3. Claims 14 – 21 and 24 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ward and Gao view of Blackburn et al. (U.S. Pat. No. 6,846,654 B1) (“Blackburn”).

Regarding claims 14 – 21 and 24, Ward does not specifically teach the incorporation of an organic membrane as claimed.

Ward does teach the incorporation of a polymer film layer 22 for immobilizing the MOSBP-1 22 (see, e.g., col. 3, lines 45 – 58; figure 1). Ward further teaches spin-coating application of layer 22 and silanization of metal and glass surfaces of the device for facilitating immobilization of binding biomolecules (see col. 3, lines 46 – 58).

Blackburn teaches the use of an organic membrane as a support material for immobilizing binding biomolecules, i.e., antibodies. Blackburn also teaches the use of lipid bilayer membranes (see, e.g., col. 16, line 37 – col. 17, line 21; col. 18, lines 5 – 29). The selection of a known material, which is based upon its suitability for the intended use, is within the ambit of one of ordinary skill in the art (see MPEP § 2144.07). In addition, the use of silylation, acylation, esterification and alkylation are chemical derivatization methods for facilitating ligand immobilization that are well known in the art (see MPEP § 2144.03). Therefore, it would have been obvious to a person of ordinary skill in the art to incorporate the use of an organic membrane as claimed with the disclosed sensing device.

Art Unit: 1743

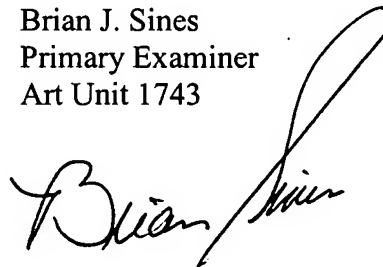
***Conclusion***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Brian J. Sines whose telephone number is (571) 272-1263. The examiner can normally be reached on Monday - Friday (11 AM - 8 PM EST).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jill A. Warden can be reached on (571) 272-1267. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Brian J. Sines  
Primary Examiner  
Art Unit 1743

A handwritten signature in black ink, appearing to read "Brian Sines", with a large, stylized loop at the end of the last name.